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Art Unit: 1742

Amendments to the Claims

22. (Currently amended) A process for treating a metal surface to reduce the coefficient of sliding friction thereon, said process comprising operations of:

(I) forming over said metal surface a coating of a liquid composition that before, during, or both before and during drying reacts with said metal surface to produce a modified solid surface with a lower coefficient of sliding friction than said metal surface; and

(II) drying said coating of liquid composition into place on said metal surface over which it was formed in operation (I), without intermediate rinsing,

wherein the liquid composition comprises water and the following components:

(A) dissolved, dispersed, or both dissolved and dispersed organic film-forming resin;

(B) dissolved, dispersed, or both dissolved and dispersed wax that is not part of immediately previously recited component (A);

(C) dissolved, dispersed, or both dissolved and dispersed hexavalent chromium; ~~and~~

(D) dissolved, dispersed, or both dissolved and dispersed pH adjusting agent that is not part of any one of immediately previously recited components (A) through (C); and

(E) at least one member selected from the group consisting of surfactants and organic solvents which are not part of the component (A) or (B);

said liquid composition having a pH of at least 6.5.

23. (Previously presented) The process according to claim 22, wherein the mass of wax component (B) in said liquid composition has a ratio to the mass of resin component (A) in said liquid composition, both of these masses being on a dry basis, that is at least about 0.02:1.0.

24. (Previously presented) The process according to claim 23, wherein the mass of the stoichiometric equivalent as CrO_3 of the hexavalent chromium present in said liquid composition has a ratio to the mass, on a dry basis, of the resin component (A) in said liquid composition that is at least about 0.0010:1.0.

25. (Previously presented) The process according to claim 24, wherein resin component (A) comprises at least one polymer selected from the group consisting of polymers comprising residues of at least one monomer selected from the group consisting of acrylic acid, methacrylic acid, maleic acid, esters of acrylic acid, esters of methacrylic acid, esters of maleic acid, acrylonitrile, methacrylonitrile, acrylamide, methacrylamide and mixtures thereof.

26. (Previously presented) The process according to claim 25, wherein wax component (B) is a polyethylene wax with a melting point in a range from about 85 to about 150°C.

27. (Previously presented) The process according to claim 26, wherein:
the ratio of the mass of wax component (B) to the mass of resin component (A), both on a dry basis, is from about 0.090:1.00 to about 0.15:1.0;
the ratio of the mass of the stoichiometric equivalent as CrO_3 of the content of hexavalent chromium to the mass, on a dry basis, of resin component (A) is from about 0.0140:1.00 to about 0.030:1.00; and
during operation (II), the metal substrate reaches a temperature of at least about 88°C.

28. (Previously presented) The process according to claim 22 wherein the surfactant comprises at least one member selected from the group consisting of anionic fluorinated surfactants, nonionic surfactants, silicone surfactants, ethoxylated silicone surfactants and mixtures thereof.

29. (Previously presented) The process according to claim 22 wherein the organic solvent comprises at least one member selected from the group consisting of esters with a structure that can be made by completely esterifying

orthophosphoric acid with at least one monoalcohol with can include halogen atoms, ether oxygen atoms and combinations thereof, esters with a structure which can be made by completely esterifying sulfuric acid with at least one monoalcohol which can include halogen atoms, ether oxygen atoms and combinations thereof and compositions of the formula R^1-O-R^2-$(OR^3)_n$-O-R^4 wherein each R^1 and R^4 may be the same or different and independently represent hydrogen, a monovalent hydrocarbon group, a halohydrocarbon group, a halocarbon group, a monovalent acyl group and a halo substituted acyl group; each of R^2 and R^3 may be the same or different and independently represent a divalent hydrocarbon group, a divalent halohydrocarbon group, a divalent halocarbon group; n represents zero or a positive integer; and wherein the R^3 group in any of the $(OR^3)_n$ groups may be the same or different form the R^3 group in any other distinct one of the (OR^3) groups.

30. (Currently amended) ~~The~~ A process for treating a metal surface to reduce the coefficient of sliding friction thereon~~, according to claim 22~~ which comprises:

(I) forming over said metal surface a coating of a liquid composition that before, during, or both before and during drying reacts with said metal surface to produce a modified solid surface with a lower coefficient of sliding friction than said metal surface; and

(II) drying said coating of liquid composition into place on said metal surface over which it was formed in operation (I), without intermediate rinsing,

wherein the liquid composition has been made by mixing with a first mass of water at least the following additional masses:

(A) a second mass of organic film-forming resin that is spontaneously water soluble, dissolved in water, dispersed in water, or any two or more of spontaneously water soluble, dissolved in water, and dispersed in water;

(B) a third mass of wax that is not part of said second mass and that is water soluble, dissolved in water, dispersed in water, or any two or more of spontaneously water soluble, dissolved in water, and dispersed in water; and

(C) a fourth mass of a source of hexavalent chromium that is spontaneously water soluble, dissolved in water, dispersed in water, or any two or more of spontaneously water soluble, dissolved in water, and dispersed in water;

said liquid composition having a pH of between 7 and 11.

31. (Previously presented) The process according to claim 30, wherein said third mass has a ratio to said second mass that is at least about 0.04:1.0.

32. (Previously presented) The process according to claim 31, wherein the mass of the stoichiometric equivalent as CrO_3, of the hexavalent chromium in said fourth mass, has a ratio to the mass, on a dry basis, of the resin component (A) in said liquid composition that is at least about 0.0050:1.0.

33. (Previously presented) The process according to claim 32, wherein the resin in said second mass comprises at least one polymer selected from the group consisting of polymers comprising residues of at least one monomer selected from the group consisting of acrylic acid, methacrylic acid, maleic acid, esters of acrylic acid, esters of methacrylic acid, esters of maleic acid, acrylonitrile, methacrylonitrile, acrylamide, and methacrylamide.

34. (Previously presented) The process according to claim 33, wherein the wax in said third mass is a polyethylene wax with a melting point in a range from about 85 to about 150°C.

35. (Previously presented) The process according to claim 34, wherein:
the ratio of said third mass to said second mass, on a dry basis, is from about 0.075:1.00 to about 0.25:1.0;
the ratio of the mass of the stoichiometric equivalent as CrO_3 of the content of hexavalent chromium in said fourth mass to said second mass, on a dry basis, is from about 0.0110:1.00 to about 0.050:1.00; and

during operation (II), the metal substrate reaches a temperature of at least about 88°C.

36. (Previously presented) The process according to claim 22, wherein the dried coating formed in operation (II) contains at least 5 mg/m^2 of chromium.

37. (Previously presented) The process according to claim 36, wherein the dried coating formed in operation (II) has a coefficient of sliding friction against stainless steel that is not more than 0.250.

38. (Previously presented) The process according to claim 22, wherein the dried coating formed in operation (II) has a coefficient of sliding friction against stainless steel that is not more than 0.250.

39. (Previously presented) The process according to claim 30, wherein the metal substrate surface coated is an alloy of aluminum and zinc.

40. (Previously presented) The process according to claim 22, wherein the metal substrate surface coated is an alloy of aluminum and zinc.

41. (Previously presented) The process according to claim 36, wherein the metal substrate surface coated is an alloy of aluminum and zinc.

42. (Currently amended) The process according to claim 22, wherein said liquid composition further comprises a concentration of from about 1.0 to about 10% of the total working composition of an organic solvent component selected from the group consisting of:

esters with a structure that can be made by completely esterifying othophosphoric acid with at least one monoalcohol ~~with~~ which can include halogen atoms, ethers oxygen atoms and combinations thereof, esters with a structure which can be made by completely esterifying sulfuric acid with at least one monoalcohol which can include halogen atoms, ether oxygen atoms and combinations thereof and compositions of the formula R^1-O-R^2-$(OR^3)_n$-O-R^4 wherein each R^1 and R^4 may be the same or different and independently

represent hydrogen, a monovalent hydrocarbon group, a halohydrocarbon group, a halocarbon group, a monovalent acyl group and a halo substituted acylgroup; each of R^2 and R^3 may be the same or different and independently represent a divalent hydrocarbon group, a halohydrocarbon group, a halocarbon group; n represents zero or a positive integer; and wherein the R^3 group in any of the $(OR^3)_n$ groups may be the same or different from the R^3 group in any other ~~distrinct~~ distinct one of the (OR^3) groups.

43. (Previously presented) The iiquid composition of matter useful as a treatment composition in the process according to claim 27, said liquid composition comprising water and the following components:

(A) a mass of dissolved, dispersed, or both dissolved and dispersed organic film-forming resin;

(B) a mass of dissolved, dispersed, or both dissolved and dispersed wax that is not part of immediately previously recited component (A);

(C) a mass of dissolved, dispersed, or both dissolved and dispersed hexavalent chromium;

wherein:

a ratio of the mass of wax component (B) to the mass of resin component (A), both on a dry basis, is from about 0.090:1.00 to about 0.15:1.0; and

a ratio of the mass of the stoichiometric equivalent as CrO_3 of the mass of hexavalent chromium to the mass, on a dry basis, of resin component (A) is from about 0.0140:1.00 to about 0.030:1.00.

44. (Previously presented) The liquid composition of matter useful as a treatment composition in the process according to claim 35, said liquid composition having been made by mixing with a first mass of water at least the following additional masses:

(A) a second mass of organic film-forming resin that is spontaneously water soluble, dissolved in water, dispersed in water, or any two or more of

spontaneously water soluble, dissolved in water, and dispersed in water;

(B) a third mass of wax that is not part of said second mass and that is spontaneously water soluble, dissolved in water, dispersed in water, or any two or more of spontaneously water soluble, dissolved in water, and dispersed in water; and

(C) a fourth mass of a source of hexavalent chromium that is spontaneously water soluble, dissolved in water, dispersed in water, or any two or more of spontaneously water soluble, dissolved in water, and dispersed in water,

wherein:

the ratio of said third mass to said second mass, both on a dry basis is from about 0.090:1.00 to about 0.15:1.0;

the ratio of the mass of the stoichiometric equivalent as CrO_3 of the content of hexavalent chromium in said fourth mass to said second mass, on a dry basis, is from about 0.0140:1.00 to about 0.030:1.00.

45. (New) A process for treating a metal surface to reduce the coefficient of sliding friction thereon, said process comprising operations of:

(I) forming over said metal surface a coating of a liquid composition that before, during, or both before and during drying reacts with said metal surface to produce a modified solid surface with a lower coefficient of sliding friction than said metal surface; and

(II) drying said coating of liquid composition into place on said metal surface over which it was formed in operation (I), without intermediate rinsing,

wherein the liquid composition comprises water and the following components:

(A) dissolved, dispersed, or both dissolved and dispersed organic film-forming resin;

(B) dissolved, dispersed, or both dissolved and dispersed wax that is not part of immediately previously recited component (A);

(C) dissolved, dispersed, or both dissolved and dispersed hexavalent

chromium; and

(D) at least one surfactant not part of the component (A) or (B) selected from the group consisting of anionic surfactants, silicone surfactants, ethoxylated silicone surfactants and mixtures thereof in an amount effective to reduce blocking.